

HIGHLIGHTS

Targeted Drug Delivery: How to Exploit Cavitation to Promote Permeability of Blood Vessels and Focus on Diseased Tissues

A new collaborative research project between Sapienza University, the Italian Institute of Technology and Temple University in Philadelphia has engineered a blood vessel and applied an innovative integrated system to measure the permeability of its endothelium. The methodology allows targeted drug delivery to curtail toxic effects on the organism. The results were published on *Small*.

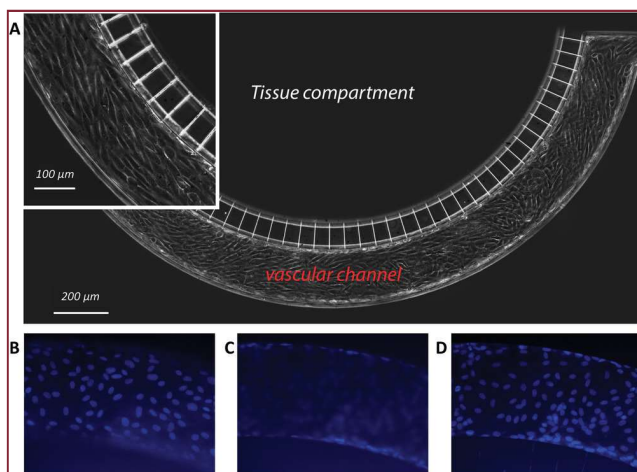
The administration of drugs through nanotechnological release systems has various advantages over conventional pharmacological therapies and, in this field, targeted drug delivery is one of the most significant opportunities for alternative drug administration methods, especially for patients in chronic conditions that require continuous massive doses of drugs and suffer from the collateral effects produced from prolonged use. Thus, studying the mechanisms that favour the focused passage of molecules through the endothelium barrier that coats blood vessels is fundamental in order to reduce the toxic effects produced by the diffusion of drugs throughout the circulatory system and in healthy tissues.

The group of researchers coordinated by Prof. Carlo Massimo Casciola of DIMA, in collaboration with the Centre for Life Nano Science at the Italian Institute of Technology (CLNS-IIT) and the Department of Mechanical Engineering at Temple University, has developed a new methodology to induce the *in vitro* aperture of inter-cellular junctions through cavitation and measurement of the permeability levels of the endothelium to improve drug efficiency and circumscribe their effect throughout the organism. The study, which has been recently published on *Small*, aims to validate protocols for *in vivo* applications of ultrasound cavitation.

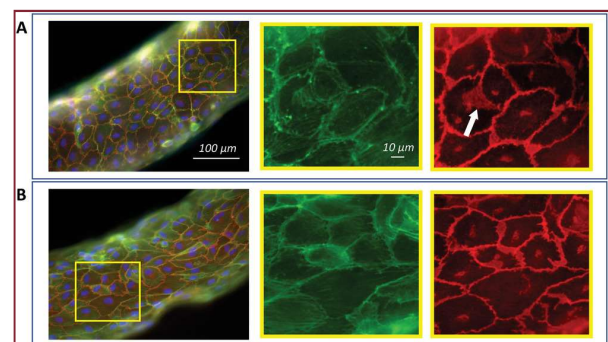
Thanks to recent progress made in the field of micro and nanotechnology, the team was able to recreate a blood vessel *in vitro*: a membrane of endothelial cells capable of acting as a biological barrier thanks to the correct formation of inter-cellular junctions.

References:

Reversible Cavitation-Induced Junctional Opening in an Artificial Endothelial Layer - Giulia Silvani, Chiara Scognamiglio, Davide Caprini, Luca Marino, Mauro Chinappi, Giorgia Sinibaldi, Giovanna Peruzzi, Mohammad F. Kiani, Carlo M. Casciola - *Small* (2019) DOI <https://doi.org/10.1002/sml.201905375>



Vessel-on-a-chip



Endothelium maturation



SAPIENZA
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NEWS FROM DIMA

PhD Welcome Day at DIMA

On Thursday 12 December, PhD welcome Day was held for doctoral students admitted to the XXXV cycle. The meeting took place in the presence of all PhD Coordinators and was opened by greetings from DIMA Director, prof. Gaudenzi, who illustrated the organization chart of the department and all different research areas. Also representatives of the doctoral students talked deepening some issues related to scientific publications. Finally, the doctoral *vademecum* was presented, which contains support information for the PhD students career.



NEWS FROM DIMA

NSE – New Space Economy European Expoforum

The NSE is an international event which will focus on the New Space Economy and its capability to promote and create new market opportunities and economic development in Europe. Organized in collaboration with Space Foundation, NSE will create an opportunity to meet and exchange views among existing and new industrial players, small and medium innovative companies, investors, startappers, research centers, space agencies and institutions with interests in space. Sectors covered will include all field moving quickly towards Space Economy as: bio-sciences, TLC, logistics, transportation, environ-mental sustainability, design creativity, exploration, planetary exploitation.

Space sector has huge opportunities for entrepreneurs and investors, there is an hidden potential and innovation in public and private research centres, universities and SMEs. DIMA attended the event with a stand in the exhibition area with the presence of professors and researchers. In the photo below, a delegation with Roberto Battiston, ASI past president, and Richard Fraccaro, Secretary of State for the Presidency of the Council of Ministers.

